GSA

GSA Office of Governmentwide Policy

REAL PROPERTY SUSTAINABLE DEVELOPMENT GUIDE

U.S. GENERAL SERVICES ADMINISTRATION
GSA Office of Governmentwide Policy
Office of Real Property

"I recognize the right and duty of this generation
to develop and use the natural resources of our land;
but I do not recognize the right to waste them,
or to rob, by wasteful use,
the generations that come after us.[3]"

- Theodore Roosevelt, 1910

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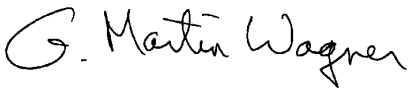

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FOREWORD

Will our children's children inherit a livable planet? The choices we make as individuals and as a society in the first decade of this new millennium will answer that question.

Today, the environmental movement isn't a "special interest," it's about the stewardship of the only planet we've got. The White House has taken a leadership role in promoting environmental stewardship, and, with the Executive Order on "Greening the Government Through Efficient Energy Management," is making Sustainable Development the way the Government strives to do business.

At the General Services Administration, through "Planet GSA," we're energizing our employees and partnering with our customer agencies and vendors to "Buy, Build, Drive, Manage and Save Green." That's just one example. In this guide, you will find useful and thought-provoking information on ways you and your organizations—and the American People—will benefit from implementing common-sense sustainable principles and ideas.

In 1962, President John F. Kennedy established the "Guiding Principles for Federal Architecture," raising the standard for Federal building design. He called for facilities that were economical to build, operate and maintain, accessible to the handicapped, and that provided "visual testimony to the dignity, enterprise, vigor and stability of the American Government." Today, with this "Sustainable Development Guide," we add to those fundamentals the principle that Federal facilities must also be sustainable. Building sustainably, we create more productive and healthier work environments that respond to today's needs—without imposing additional costs on future users.

Let's join together on this important journey ahead. Remember, it all comes back to us!

Dave Barram
Administrator

EXECUTIVE SUMMARY

Today's successful businesses know that environmental management and environmental functions are integral parts of an organization's everyday operations and its strategic plan. These companies are successful because they understand the environmental implications of their business functions, such that environmental issues are considered essential components of business processes, rather than consequences of those processes. Sustainable development is about planning and carrying out your agency's mission today —with full consideration of the external factors that could affect the achievement of long-term goals. In today's competition for limited funds, resources, and workers, the advantage goes to organizations demonstrating commitment to long-term value.

Long-term value and economy are goals of Executive Order(EO) 13123, "Greening the Government through Efficient Energy Management," issued June 3, 1999. However, the Order goes beyond these goals. It establishes that sustainable design principles shall be applied to Federal projects in order to reduce pollution and other environmental costs associated with facility construction, operation, and eventual decommissioning.[1]

For decades, the Federal Government has led the Nation in the energy efficient, resource-conserving building design, construction, and operation exemplified by this and other Executive Orders. We have also made great progress in water conservation, use of recycled products and renewable energy sources, reducing emissions that contribute to air pollution and global climate change. But, simply promoting greater efficiency in the use of our resources is no longer enough. By applying sustainable principles, we can also create better work environments and communities. Rethinking standard design practices, using environmentally preferable products, and reexamining how we use and maintain our facilities will also lead to a healthier and more productive workforce.

Sustainable development shouldn't mean another layer of bureaucracy in your organization. Initially you might need an agency expert or advocate but eventually it will become an integral part of your organization and culture. Today as the design and construction industry "gets up to speed," additional design efforts may be required; but like many code requirements we now take for granted, sustainable development and design will become the way business is done every day.

Understanding the basic principles of sustainable development will allow you to transform your operations in a logical and productive way.

Principles of Sustainable Development for Federal Agencies
(For siting, design, and construction, developed under Executive Order 13123)

Site:	Optimize Site Potential
Energy:	Minimize Nonrenewable Energy Consumption
Materials:	Use Environmentally Preferable Products
Water:	Protect and Conserve Water
I E Q:	Enhance Indoor Environmental Quality
O & M:	Optimize Operational and Maintenance Practices[2]

SUSTAINABLE DEVELOPMENT

INTRODUCTION - WHAT IS SUSTAINABLE DEVELOPMENT?

This guide will help you to understand what sustainable development means and how to take advantage of its benefits by making its principles and practices part of everything you do.

Sustainable development means integrating the decision-making process across your organization, so that every decision is made with an eye to the greatest long-term benefits. It means eliminating the concept of waste—thinking "cradle-to-cradle" rather than "cradle-to-grave,"[4]—and building on natural processes and energy flows and cycles; recognizing the interrelationship of our actions with the natural world.

Are you creating more productive and healthier work environments; ones that respond to today's needs without imposing additional costs upon future users? Are you considering the impact on the environment and on future generations? When sustainable development informs every business decision you make, chances are you are making the right decisions - those that benefit you, your agency, the environment, and your bottom line.

Imagine buildings producing more energy than they use, water cleaner when it leaves the building than when it arrived[5], better indoor light and air quality, and healthier and more productive work environments. Imagine projects where physical, biological, socioeconomic, cultural and environmental needs are so complete, that the Environmental Assessment concludes: no mitigation required.

These ideas, developed by William McDonough, Dean Emeritus of the School of Architecture at the University of Virginia, and Amory Lovins, President and Executive Director of the Rocky Mountain Institute, are transforming major corporations and Federal agencies by unifying their programs and policies and giving them the competitive advantages that guarantee long-term success.

You're probably already using some of the "eco-efficient" building blocks of sustainable development[6], such as those found in GSA's "Planet GSA" program. These include buying

"green" products and services, using materials with recycled content in construction and managing construction waste. You're "saving" and "driving green," through use of alternative fueled vehicles, Energy Star® equipment, and alternative energy sources, and managing "green" by implementing waste prevention strategies, increasing office waste recycling and the amount of property reused or donated, and training employees to think "sustainably."

Remember, though, that sustainable development means more than reducing harm to the environment. Slowing the rates of contamination and depletion of nature is important, but it doesn't stop these degenerative processes. Recycling, for instance, can reduce the quality of a material over time, down-cycling it, making reuse and disposal more difficult.[7] To be sustainable, we must pursue "eco-effectiveness" and begin up-cycling with regenerative rather than depletive practices.

So, what does it take to go beyond simply minimizing harm to the environment to creating a positive, sustainable society?

DEFINITIONS - THE HANNOVER PRINCIPLES AND OTHER PERSPECTIVES

Many individuals and organizations have defined sustainable development. Here are some of the best examples:

THE HANNOVER PRINCIPLES, 1992

Developed by William McDonough and Michael Braungart, the Hannover Principles were among the first to comprehensively address the fundamental ideas of sustainability and the built environment, recognizing our interdependence with nature and proposing a new relationship that includes our responsibilities to protect it. The Principles encourage all of us - you, your organization, your suppliers and customers - to link long term sustainable considerations with ethical responsibility, and to re-establish the integral relationship between natural processes and human activity. When you make decisions in your organization, remember these essential Principles:

** Recognize interdependence. Simply put: everything you do personally, in your organization and through your work interacts with and depends upon the natural world, at every scale, both locally and across the globe.*

** Eliminate the concept of waste. Are you considering the full, life-cycle consequences of what you create or buy?*

** Understand the limitations of design. Treat nature as a model, not as an inconvenience to be evaded or controlled.*[9]

BRUNDTLAND COMMISSION, 1983

"Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs."[8]

THE WHOLE BUILDING DESIGN GUIDE

"Sustainability is a mode of thinking and acting responsibly. It is grounded in the knowledge that all of life is interdependent - that local actions may have global conse - quences. The basic objectives of sustainability are to:

1. Reduce the consumption of energy, land, and other nonrenewable resources.

2. Minimize the waste of materials, water, and other limited resources.

3. Create livable, healthy, and productive environments."[10]

DEPARTMENT OF DEFENSE

"Sustainability is a concept that recognizes human civilization is an inte - gral part of the natural world and that nature must be preserved and perpetuated if the human community is to sustain itself indefinitely. By subscribing to the funda - mental concepts of sustainability and applying them to every and all aspects of human existence, improvements can be made to the existing condition that will insure a life-giving and healthful world for future generations.[11]

Sustainable planning supports mutually beneficial relationships between planning and environmental organizations to coordinate on common goals and objectives, share data, and reach consensus on land and facilities issues. The focus of environmental organizations is environ - mental protection, conservation, restora - tion and compliance. Sustainable planning seeks to build on the accomplishments of these programs by taking a holistic approach to planning for facilities and land that balances the needs of mission with the natural systems that are the focus of environmental efforts."[12]

WORLD BUSINESS COUNCIL FOR SUSTAINABLE DEVELOPMENT

"Sustainable development involves the simultaneous pursuit of economic prosperity, environmental quality and social equity. Companies aiming for sustainability need to perform not against a single, financial bottom line, but against [this] triple bottom line."[15]

NATIONAL PARK SERVICE

"Sustainability does not require a loss in the quality of life, but does require a change in mind-set, and a change in values toward less consumptive lifestyles. These changes must embrace global interdependence, environmental stewardship, social responsibility, and economic viability. Sustainable design must use an alternative approach to traditional design that incorporates these changes in mind-set. The new design approach must recognize the impacts of every design choice on the natural and cultural resources of the local, regional, and global environments.

For our society to be sustainable, we must: (1) use all resources (energy, water, material, and land) efficiently and minimize waste; (2) protect the natural environment, the source of all our resources; and (3) create a healthy built environment for future generations.

The concept of sustainable development recognizes that human civilization is an integral part of the natural world and that nature must be preserved and perpetuated if the human community itself is to survive. Sustainable design and development creates buildings (and supporting infrastructure) that minimize the consumption of resources and reduce harmful effects on the environment. It provides an integrated approach where building elements, materials and systems are designed and appraised as integrated parts of the entire project. All phases of a facility's life must be considered, thereby optimizing the interrelationships of materials and systems, operation, maintenance, and use."[13]

Photo courtesy of HOK Architects

ENVIRONMENTAL PROTECTION AGENCY - 7 PRINCIPLES

1. Pollution Prevention: Consider a product or service's environmental impact early in the purchasing decision process.

2. Multiple Attributes: Targeting a single environmental attribute can obscure other environmental impacts that might cause equal or greater damage.

3. Life-Cycle Perspective: Consider potential environmental impacts at all stages of the product or service's life cycle, starting with raw materials acquisition, through manufacturing, packaging and transportation, distribution, use, maintenance, or disposal.

4. Magnitude of Impact: Consider the scale (global vs. local), the permanence of a product or service's environmental impact, and the degree to which an impact is reversible.

5. Local Conditions: Factor in where and how a product or service is used when evaluating environmental impact.

6. Competition: Incorporate environmental attributes of products and services in competition among vendors.

7. Product Attribute Claims: Examine product attribute claims carefully and rely on more than one information source to evaluate environmental attributes.[14]

THE BUSINESS CASE FOR SUSTAINABLE DEVELOPMENT

Improving People's Health, Safety, and Productivity

How and what you build, and the manner in which you operate and maintain your facilities has a tremendous impact not only on the environment, but also your bottom line. Applying sustainable development principles will reduce waste, and lower long-term maintenance and operating costs. Equally important, is the impact on your most valuable resource - your employees. Recruiting is made easier when the organization demonstrates a commitment to the well being of workers and their communities.

A healthier indoor environment, the presence of natural light, as well as fresh air can greatly affect the health, safety and productivity of those who visit and work in your facilities every day. Epidemiologists estimate that 20 to 30 percent of American office workers are affected by varying degrees of Sick Building Syndrome.[16] The emphasis on building energy efficient, super-insulated homes and offices, without adequate consideration of proper ventilation, has produced indoor environments, contaminated with stagnant air and airborne particulates. Unventilated copying and fax machines can aggravate the situation, as can the use of cleaning materials containing toxic chemicals.

Commonly used furniture, carpeting, and cleaning products often contain dangerous chemicals that "off-gas" directly into our air environment, contributing to an unhealthy indoor air environment. Even gas ranges, space heaters, and central heating systems can emit harmful by-products.[17]

Old formulations and work practices must be reexamined if the air we breathe in our workplaces is to improve. Consistent application of sustainable design principles will help you choose the materials and conditions that benefit your employees and customers, the nation's environment, and your bottom line.

Photo courtesy of Dennison University

"If everybody on earth lived like today's North Americans, it would take at least two additional planet Earth's to produce the resources, absorb the wastes, and otherwise maintain life-support.

Preliminary estimates show that the ecological footprint of today's consumption in food, forestry products and fossil fuels alone might already exceed global carrying capacity by roughly 30 percent. About three quarters of the current consumption goes to the 1.1 billion people who live in affluence, while one quarter of the consumption remains for the other 4.6 billion people."[20]

- Mathis Wackernagel and William Rees

"You can't do something like this half way or selectively or in pieces because people, rightly, will look at all your actions and ask, 'Do they all fit together?' I would rather err on the side of aggressiveness. Even if a lot of the dire predictions don't come true, and I hope they don't, what we will have accomplished will have been for the good of the world anyway. And the other thing is, it's great for you and your employees...They feel better about the company they work for. They feel energized by it. They're proud to tell their children they work for Ford. And that pays off in a lot of ways you can't measure. So it's the right thing to do, not only for society, but it's the right thing to do for our own company."[21]

- William Clay Ford, Jr., Chairman, Ford Motor Company

Green buildings compete in bottom-line terms as well as in aesthetics. They are relatively inexpensive to build, operate, and convert to their next use, as human needs inevitably evolve. Their mechanical systems to maintain comfort are small and well designed, or better still, eliminated by design. More buildings will be built around, within, or from recycled old ones.[22]

- Hawken, Lovins and Lovins

Simply abiding by regulatory require - ments, for example, is often no longer enough to protect the right to operate: in an instant-news world, negative public reaction can come swiftly and furiously. Eliminating waste can lead to huge cost savings as well as lower liabilities. In just one semiconductor business studied by the World Resources Institute, 96 percent of its annual $2 billion purchase of chemicals ended up in the waste stream, meaning that reducing waste by half could add up to $1 billion to the firm's bot - tom line...

When a business builds environmental or social benefit into products, it creates added value for the customer. The search for these benefits often yields unforeseen enhancements to product performance, cost, quality, safety and serviceability. Visionary companies can thus position themselves to supply novel sys - tem solutions. This often means rethinking the entire business model.

DuPont's sulfur products business offers acid handling and recovery services to its customers. Some customers never actually own or handle the materials themselves and instead contract for DuPont's expertise, which is a distinct competitive advantage for the company. All these services make it more costly for customers to switch to competitors, especially when the service is not standard in the industry.

Interface is a $1 billion multinational company that is making major changes to its operations in the belief that sustainable development is a good business strategy. Led by CEO Ray Anderson, a vocal champion for the environment, this carpet company has developed the "Evergreen Lease." Through this program, the company aims to never again sell another roll of carpet, instead transforming itself into a service company by leasing flooring systems to cus - tomers. With such a system, Interface will be able to collect its old carpet tiles and recycle them into new ones, building customer loy - alty while driving down material costs. Interface's commitment has also led to a waste-reduction program and a pledge to switch entirely to renewable energy sources.[18]

- From BUSINESS WEEK, May 3, 1999

"The technologies of the future will enable us to feed our factories with closed loop, recycled raw materials that come from harvesting the billions of square yards of carpets and textiles that have already been made —nylon face pile recycled into new nylon yarn to be made into new carpet; backing material recycled into new backing materials for new carpet; and in our textile business… polyester fabrics recycled into polyester fiber, then to be made into new fabrics —closing the loop; using those pre - cious organic molecules over and over in cyclical fashion, rather than sending them to landfills or down-cycling them (into lower value forms) by the linear processes of the first industrial revolution. Linear must go; cyclical must replace it.[19]

- Ray Anderson, Chairman and CEO, Interface, Inc.

"Let's talk about sustainability in a new way. I don't like the word sustainability very much actually. It's useful because nobody knows what it means, it's long, it can go everywhere, therefore travels well, so that's good. We can all use it, but if you think about sustainability, is it really that exciting? What if I asked you, 'How is your relationship with your husband?' and you say 'Sustainable.' It's not that interesting really. I would almost feel as if I had to say, 'I'm sorry to hear that.' So, shouldn't we really be looking for something that is actually fecund - you know that's full of blood, and vigor and excitement?" [23]

- William McDonough, William McDonough +Partners

THE SUSTAINABLE WORKPLACE

MEETING YOUR REAL PROPERTY NEEDS SUSTAINABLY

If we think of providing sustainable workplaces as a service, rather than as a commodity, we will build what is most economical for us to maintain and operate, and easiest for occupants to comfortably and productively use.[25] The sustainable workplace, like the "Integrated Workplace", is the result of a comprehensive, multidisciplinary process that results in more productive and responsive facilities. Sustainable products and methods are an essential part of creating better work environments. As discussed in this Office's publication "The Integrated Workplace: A Comprehensive Approach to Developing Workspace," productivity and health-related problems are greatly influenced by the workplace. This strategic approach unifies the workplace with an organization's strategic plan and provides space that best supports the work practices of those using it. Both work best when they are considered sustainably.

How we develop the workplace greatly influences the well being and performance of employees and the organization. Asustainable approach considers many workplace aspects:

* *How we work: including "paperless" offices, using remanufactured, recycled, and energy-efficient products.*
* *Where we work: including conventional or alternative office settings, like teleworking from home, at a telecommuting center or customer's office, or from anywhere.*
* *How we get to work: including the use of mass transit and transit subsidies, alternative-fuel vehicles, bicycles, and even walking from nearby housing.*
* *How we build, lease, furnish, and ultimately dispose of our buildings: funding projects on the basis of lowest life-cycle rather than first cost, adapting and reusing historic structures, repopulating urban centers, using recycled-content construction materials, minimizing construction waste, and installing energy management control systems with energy-efficient equipment.*
* *How we operate and maintain our buildings: including use of reformulated chemical products, native landscaping materials, regular maintenance and "tune-up" of systems, minimizing operation hours, and using smaller building zones that facilitate controlled use of equipment and lighting.*[26]

Using and building on available natural light and ventilation can reduce stress and improve workers'

cognitive skills and performance while reducing energy consumption and operating costs. Today's HVAC designs provide increased fresh air in tenant controlled environments. New lighting technologies supply ample light to offices without glare or heat buildup, complementing natural light and exterior views.[27]

The sustainable workplace is an excellent tool for promoting an organization to its customers. Most importantly, it can attract and retain talented workers, instilling dedication and pride-of-ownership when employees can relate to working in a place, and for an organization, that is committed to protecting the earth and demonstrates that commitment through its actions.

Finally, when a workplace is designed and built for sustainability, less money needs to be spent on replacements and retrofits as work practices and organizations change, and less productivity is lost in the process of making changes.[28]

Buildings are where Americans spend about 90 percent of their time. They use one-third of our total energy and two-thirds of our electricity. Their construction consumes one-fourth of all harvested wood; 3 billion tons of raw materials are used annually to construct buildings worldwide.[29] Buildings consume 17 percent of water and 50 percent of chlorofluorocarbons (CFCs). They also produce, directly or indirectly, 33 percent of Carbon Dioxide (CO_2) and 40 percent of landfill waste.[30]

How do you build sustainably? Many architectural and engineering design firms have committed to sustainable development, incorporating its principles into projects as a matter of course.[31]

Carrier, the world's leading maker of air-conditioning equipment, decided that it might as well capture [their] efficient and reliable equipment's operating benefits by offering "coolth services." Carrier's new "comfort lease" ...focuses on maintaining comfort... Customers, Carrier reasoned, don't want what an air conditioning system is; they only want what it does. How does one lease coolth? At first, the plan was merely to provide cooling as a commodity. But now Carrier is starting to team up with other service providers so it can not only deliver cooling but also do lighting retrofits, install superwindows, and otherwise upgrade customers'buildings so they'll ultimately need less air conditioning to provide better comfort and then Carrier can provide not the coolth but the comfort.[24]

Hellmuth, Obata + Kassabaum, Inc., a leading architecture, engineering, interiors and planning firm, has adopted these Key Elements of Sustainable Design, similar to those found in EO 13123:

Strategic Facility Planning and Programming - Determining whether to renovate or build new, sell existing facilities or lease, consolidate or decentralize, is critical to ensuring long-term viability, resource conservation and life-cycle cost benefits.

Site Work and Planning - Environmentally sensitive planning looks beyond the project site. It evaluates linkages to transportation, infrastructure, and ecosystems, and considers solar and wind orientation, local microclimate, drainage patterns, utilities and existing site features to develop optimal building siting with appropriate low maintenance landscaping.

Energy - Building orientation and massing, natural ventilation, daylighting and other passive strategies, can all lower a building's energy demand while increasing the quality of the interior environment and comfort of the occupants. The efficiency of required systems is maximized through use of advanced computer modeling and life-cycle cost analysis.

Building Materials - Environmentally preferable building materials are [appropriately] durable and low maintenance. Careful selection and specification can limit impacts on the environment and occupant health, while remaining within the parameters of performance, cost, aesthetics and availability.

Indoor Air Quality - Indoor air quality is most effectively controlled through close coordination of architecture, interior design and mechanical, electrical and plumbing design strategies that limit sources of contamination before they enter the building. Construction procedures for IAQ and post-occupancy user guides also contribute to good long-term IAQ.

Water - Site design strategies that keep rainwater on the site and, where feasible, consider on-site treatment and reuse of building gray water and wastewater. Low flow plumbing fixtures, appropriate landscaping and HVAC and plumbing system design also conserve water.

Recycling and Waste Management - Waste and inefficiency can be limited during construction by recycling demolition and construction waste, reuse of on-site materials, and monitoring of material use and packaging. Accommodating recycling into building design reduces waste while generating revenues.

Building Commissioning, Operations and Management - Effective building commissioning is essential to ensure proper and efficient functioning of systems. Facilities operations benefit from indoor air quality and energy monitoring, and from policies for water saving, waste reduction and environmentally sensitive maintenance.

Strategic Environmental Management - By integrating long-range environmental considerations into their proactive planning process, manufacturing-based companies can eliminate emitted or discharged pollutants. Strategic environmental management helps corporations understand and assess environmental risks and opportunities, so they can make informed decisions about their facilities and processes.[32]

IMPLEMENTING SUSTAINABILITY

MAKING IT HAPPEN IN YOUR ORGANIZATION -CRITICAL FACTORS

Sustainability will come as an evolution, not a revolution, and will be achieved through a series of steps, each of which contributes a small incremental improvement. Making everyone in the organization aware of the concept of sustainability is essential if it is to have an effect on day-to-day decision making and operations.

What are the critical factors involved in implementing a sustainable development strategy?

First, executive leadership must understand sustainability, and commit to its principles. It is not enough to simply recycle paper, apply some "green" design concepts, and encourage individual divisions to adopt "green" practices. Edgar Wollard of DuPont, Frank Popoff of Dow Chemical, August Busch of Anheuser Busch and former Bristol-Myers Squibb Chairman Richard Gelb are all examples of corporate visionaries that have seized this opportunity for positioning their companies for the long term.

Second, the most successful organizations have an established vision and mission which gets translated into specific long-term improvement objectives and targets with high level visibility throughout all levels of the organization. Interface, Inc.'s Ray Anderson promotes "Doing well by doing good," through a detailed set of principles known as PLETSUS (Practices LEading Toward SUStainability) that brings together ideas for living and working sustainably and uses them to define the company's mission.[33]

Third, there must be a formalized process for identifying the environmental aspects and impacts of an organization's operations, products and services.

Fourth, training is crucial to attaining the necessary awareness, skills and knowledge for transforming the organization into a sustainable development culture.

Finally, performance must be measured. Performance measurements include audits, measuring the effectiveness of management systems and metrics that track day to day operations.[34]

Reaching and maintaining sustainability is a continuous process of reexamination and relearning. In a September 1999 gardening column, Washington Post gardening writer Charles Fenyves, told readers to conserve water by planting Russian Olives, not thirstier trees like maples and poplars. This was a good first step towards

creating more suitable, low maintenance landscapes for the region. Two months later, after learning about the Russian Olive's negative impacts, such as competition with native plants, Mr. Fenyves reexamined his first advice, and recommended native American trees, like buckeyes and yellowwoods, that not only saved water, but also enriched and complemented other elements of the landscape.[35]

The tools for planning and managing a sustainable project already exist. Your project report or management plan can define sustainable goals as a basic project element. In larger projects, the report or plan can also be the Environmental Assessment (EA) with the mitigating actions as an integral part of the program. That way, the project scope can evolve to meet agency needs while minimizing its impact on the environment.

USDA's Forest Service's forest management plans are done this way. The EA identifies the Service's preferred alternative, which is developed in detail as the proposed management plan approach, with alternatives discussed only in the EA. The two documents are cross-referenced, and remain together throughout the review process. This procedure provides for concurrent compliance with the public review requirements of both the National Environmental Policy Act (NEPA) and the National Forest Management Act.[36]

PAYING FOR IT

The world we have created today as a result of our thinking thus far has problems that cannot be solved by thinking the way we thought when we created them. - Albert Einstein[37]

Because of ongoing budget constraints, the Federal projects most likely to be approved are those with the lowest first cost. Unfortunately, these are not always the most sustainable. Faced with a variety of competing demands—program funding requirements, life-cycle and present value costs, environmental considerations, economics and social issues—managers find themselves torn between recycling seemingly economical, tried-and-true solutions and moving to new ways of doing business that balance environmental sensitivity and long-term benefits with other costs. As Einstein suggests, we need a new, or at least a different, way of thinking if we are not only to overcome existing problems, but also minimize the impact of today's decisions on tomorrow's quality of life.

So how do you pay for sustainable development? A better question is - how much can you save? Sustainable considerations today can result in operational savings in later years, increased worker productivity, and reduced contingent liability. New thinking and new economic parameters must be considered. The very question, "How do you pay for incorporating sustainability into project development?" highlights the difficulty faced in approaching the subject without a change in organizational thinking.

Sophisticated design and construction strategies, and inclusion of "green" clauses in procurements can result in even lower first costs; and the life-cycle costs, including a project's environmental and economic impacts throughout its lifetime - are usually lower. In some cases, first cost may be the same—as when a building shell upgrade results in a smaller mechanical system—but the savings come in reduced operating and maintenance costs.

Tenants may wish to contribute to the study of sustainable design alternatives or to enhance capital costs, which may translate into reduced operating costs and adjustments to rent in the short-term and, with efficient building systems installed, reduced long-term operating costs. With sustainable planning and true cost accounting, planners and decision-makers will focus on sustainable development alternatives that have both fiscal and environmental cost savings.[38]

Federal managers, in considering the breadth of sustainability, must reconcile conflicts between separate operating and capital budgets and between life cycle and first costs. Typically, first capital cost has been the key to project budgeting. However, to operate sustainably, we need to integrate economic evaluations that compare first costs plus operating costs when developing facilities and their systems. We must also recognize that, in an annual operating budget environment such as that of the Federal Government, decision makers have traditionally emphasized first cost minimization, often to the detriment of ongoing operating and maintenance budgets and future flexibility and utilization.

The good news is that guidelines exist for consideration of true life-cycle costs, and that EO 13123 reinforces those guidelines. The Order directs agencies to "optimize life-cycle costs, pollution, and other environmental and energy costs associated with the construction, life-cycle operation, and decommissioning of facilities."[39] Further, alternative financing such as Energy-Savings Performance Contracts and utility energy-efficiency service contracts also make sustainable features more affordable. Remember too, that because the Government plans its facilities for a 50/100-year life, economic analyses should not depend solely on the private sector's tax-driven, 30-year, timeframes if they are to accu-

rately represent the economics of the project.

Remember that the issue is not simply one of sustainable design or construction, but rather of sustainable development, which supports every aspect of an organization's mission. And remember that real property solutions for mission-related requirements must include the entire facility life-cycle: from the identification of need, through design, construction, occupancy, operation and maintenance, and eventual disposal.

DESIGN TOOLS

Your planners, architects and engineers should already be familiar with the best design tools available:

The U.S. Green Building Council's Leadership in Energy and Environmental Design (LEED™) Green Building Rating System™ provides guidance in the areas of building development and design which results in a more sustainable project. Points, in the form of credits are given for design features that lead to a truly sustainable building. By incorporating as few as 50 percent of the available credits, buildings can usually reach the LEED Building Bronze™ rating level, generally at no additional cost. The top rating, LEED Building Platinum™ goes to buildings with at least 81 percent of the available credits. Complementing the LEED™ Building Rating System is the soon-to-be-issued LEED Interiors™ Rating System, which is intended to be a definitive standard for what constitutes a green interior space in new and existing commercial, institutional, and high-rise residential buildings.

The Navy[40], Department of State[41], and GSA[42] have adopted the LEED Building Bronze™ as their building standard.

THE BASIC LEED™ COMPONENTS COVER:

* *Prerequisites, including building commissioning, indoor air quality, smoking, energy efficiency and thermal comfort, water conservation and quality.*
* *Building Materials, including those with low levels of volatile organic compounds (VOC's), use of local materials, recycled content, and a construction waste management plan.*
* *Energy Efficiency, including heat recovery, natural ventilation and advanced systems such as EPA's Green Lights Partnership or Energy Star Building Certification.*
* *Existing Building Rehabilitation, including use of the structural shell.*
* *Indoor Air Quality, including a construction management plan and a permanent air monitoring system.*
* *Landscaping, including reducing heat islands, shade cover, and reflective roofing materials.*
* *Siting and Site Development, including reduced habitat disturbance or building rehabilitation, site restoration, infill development or building rehabilitation, and brownfields development.*
* *Transportation, including alternative transportation facilities, bicycle racks, shower and changing facilities, transit and pedestrian-facility physical linkages or carpool parking, efficient building location, and alternative fueling facilities.*
* *Water Conservation, including water-conserving fixtures and cooling towers, gray water recovery system, water efficient landscaping, surface runoff control, and biological waste treatment.*[43]

The Department of Energy's Greening Federal Facilities is a resource guide for Federal facility managers to help them reduce energy consumption and costs, improve working environments, and reduce the environmental impacts of their operations.

A new, major resource is the Whole Building Design Guide (WBGD) website, developed by NAVFAC, GSA, and the U.S. Department of Energy's Federal Energy Management Program, through the National Institute of Building Sciences (NIBS). The WBDG is a comprehensive, Internet-based gateway to a wide range of federal and private sector, sustainable development resources, including information design criteria, building types, products and systems, available online at http://www.wbdg.org.

These guides are good first steps. But, remember that true sustainable development is not about replacing previous standards with new ones. Rather, it is about new ways of thinking and working.

ENVIRONMENTAL AUDITS & BENCHMARKING

MAKING AND MEASURING MEANINGFUL CHANGE

Environmental reporting metrics and processes are making private sector firms more environmentally responsible and more competitive. In contrast to a decade ago when few, if any, major companies considered environmental concerns beyond regulatory requirements, 35 percent of the world's 250 largest corporations now issue environmental reports. These companies now know that environmental indicators are essential tools for decision-making and that voluntarily instituted "green" programs and procedures pay off in identifiable cost savings and new business opportunities, improved corporate image and recruitment, and reduced liability.[44]

There are sustainable development issues associated with every business process, beyond the "primary" environmental impacts of air, water and land emissions. Environmental considerations must be integrated into your business functions, and tracked and adjusted to make certain that they are effective. Integrating and tracking environmental considerations into your business processes might include:

* *Considering the "multiplier" effect of reengneering your entire operation, including increases in productivity and worker retention.*
* *Ensuring that environmental issues are considered during the design process, along with other criteria like performance and cost.*
* *Communicating regularly with suppliers about the environmental issues associated with the use of their products and services.*
* *Including environmental costs associated with a product or process, along with the other customary factors included in financial analyses used for decision-making.*
* *Integrating formalized environmental management systems (EMS), like the ISO 14001 standard, into business processes analyses.*
* *Screening potential purchases or potential product designs against chosen environmental criteria, as a basis for selection.*[45]

As part of the $2 billion overhaul of Ford Motor Company's historic Rouge River Plant in Dearborn, MI, William McDonough was asked to look beyond the 1,212-acre complex to consider the entire $150-billion company. Ford asked him to talk to all the top executives, scientists, engineers and car designers to see how they might think differently about design of their cars, trucks, factories and office buildings. Working with Battelle's Pacific Northwest National Laboratory and the University of Virginia's Darden School of Business, new metrics are being developed that consider the multiplier effect, creating the tools to measure things like: reduction of contingent liabilities, community relations, regulation costs, and marketing benefits. Every project should have goals such as these: worker retention, improving employee attendance, reducing injuries and worker compensation claims, and "celebrating people as the company's most valuable asset." Remaking the Rouge Complex into a model of environmental and community responsibility will take 20 years, they say, but it won't take that long for workers, neighbors and visitors to notice a difference.[46]

IMPORTANT CONSIDERATIONS

How can you improve your bottom line and the environment? Do you know what your organization is doing to become sustainable? Does your organization know how sustainable practices can advance your business goals?

What are you doing to be more sustainable? Think about what today's leading companies are doing to position themselves for success in the new century, and ask yourself, your superiors, your co-workers and your employees to consider these important questions:

**** Are you providing leadership in your organization?***

* ** Demonstrating commitment to sustainable principles?*
* ** Establishing long-term improvement objectives, throughout all levels of your organization?*
* ** Examining your mission statements and strategic plans to identify the environmental aspects and impacts of your operations, products and services?*
* ** Measuring the effectiveness of the systems and metrics that track your day-to-day operations?*
* ** Incorporating work processes and technology as tools to improve productivity, as well as building better workplaces?*
* ** Consciously looking for sustainable products, like low VOC paints and flooring?*
* ** Improving employee productivity?*
* ** Providing training to your employees?*

**** Are you creating value through your facilities programs?***

* ** Creating flexible workplaces that respond to your changing work practices and culture?*
* ** Reducing building operations costs?*
* ** Lowering liability from potentially hazardous construction and cleaning materials and practices in the workplace?*
* ** Promoting local development opportunities?*

**** Are you and your organization:***

* ** Complying with Executive Order 13101, "Greening the Government Through Waste Prevention, Recycling, And Federal Acquisition," reducing consumption and waste of natural resources and increasing conservation?*
* ** Increasing efficiency of equipment, systems and resources?*
* ** Using renewable energy, such as passive solar heating, cooling and thermal storage, and photovoltaics?*
* ** Increasing the quality of indoor air, light, noise, temperature, and humidity?*
* ** Reducing product impact on the environment and reducing or eliminating toxic and hazardous substances?*
* ** Re-using historic buildings and existing facilities?*
* ** Creating livable environments, reducing negative transportation impacts, and enhancing your community's quality of life?*

**** Are you and your organization moving beyond eco-efficiency to eco-effectiveness?***

**** Are you complying with EO 13123, and improving your organization's bottom line and the environment?***

IDEAS/CASE STUDIES AND RESOURCES

IDEAS

"THE HANNOVER PRINCIPLES: DESIGN FOR SUSTAINABILITY"- WILLIAM MCDONOUGH

1. Insist on rights of humanity and nature to co-exist in a healthy, supportive, diverse and sustainable condition.
2. Recognize interdependence. The elements of human design interact with and depend upon the natural world, with broad and diverse implications at every scale. Expand design considerations to recognizing even distant effects.
3. Respect relationships between spirit and matter. Consider all aspects of human settlement including community, dwelling, industry and trade in terms of existing and evolving connections between spiritual and material consciousness.
4. Accept responsibility for the consequences of design decisions upon human well-being, the viability of natural systems and their right to co-exist.
5. Create safe objects of long-term value. Do not burden future generations with requirements for maintenance or vigilant administration of potential danger due to the careless creation of products, processes or standards.
6. Eliminate the concept of waste. Evaluate and optimize the full life-cycle of products and processes, to approach the state of natural systems, in which there is no waste.
7. Rely on natural energy flows. Human designs should, like the living world, derive their creative forces from perpetual solar income. Incorporate this energy efficiently and safely for responsible use.
8. Understand the limitations of design. No human creation lasts forever and design does not solve all problems. Those who create and plan should practice humility in the face of nature. Treat nature as a model and mentor, not as an inconvenience to be evaded or controlled.
9. Seek constant improvement by the sharing of knowledge. Encourage direct and open communication between colleagues, patrons, manufacturers and users to link long term sustainable considerations with ethical responsibility, and re-establish the integral relationship between natural processes and human activity."[47]

"NATURAL CAPITALISM: CREATING THE NEXT INDUSTRIAL REVOLUTION"- PAUL HAWKEN, AMORY LOVINS, & L. HUNTER LOVINS

The economic advantage of green design extends throughout and beyond the project's operating life, but it begins with the design, approvals, and construction process. Integrative design may also initially appear to be more costly, but that premium quickly vanishes as designers gain experience with it, and it is more than offset by the savings on hardware. Although many developers assume that green buildings must cost more to build, green design can actually decrease construction costs, chiefly by saving infrastructure expenses and by using passive heating and cooling techniques that make most costly mechanical equipment unnecessary. While efficient new buildings save around 70-90 percent of traditional energy use, and often several percent in capital cost, they offer three additional and even more valuable economic benefits:

* *Green projects typically sell or lease faster, and retain tenants better, because they combine superior amenity and comfort with lower operating costs and more competitive terms. The resulting gains in occupancies, rents, and residuals all enhance financial returns.*

* *The buildings'greater visual, thermal, and acoustic comfort creates a low-stress, high-performance environment that yields valuable gains in labor productivity, retail sales, and manufacturing quality and output. These improvements in turn create a key competitive advantage, and hence further improve real estate value and market performance.*

* *Better indoor air quality can improve health and productivity and reduce liability risks. The EPA estimates that building-related U.S. illnesses account for $60 billion of annual productivity lost nationwide, and a wider study valued that loss as high as over $400 billion.*

People are not simple, uniform entities that thrive in a box. They are, rather, complex living organisms that evolved in and still function best in a dynamic and diverse environment. Buildings that are alternately a solar oven or a walk-in refrigerator, with discomfort and energy bills to match, are coming to be seen as unacceptable.[48]

"MID-COURSE CORRECTION" - RAY C. ANDERSON

PEOPLE:

Customers: Provide honest information about the known environmental impacts of your company and product. Share your understanding of environmental issues and natural systems with customers.

Employees:

Culture - Encourage employees to question status quo and take risks, that encourages life long learning, and engages the creativity of all employees and associates.

Understanding - Educate all employees on the corporate sustainability vision, on basic environmental principles and workings of natural systems, and create a mechanism for employees to share knowledge on best practices.

Involvement - Ask employees to give input into improving environmental impacts of their job and [what] the company could do to make their job more pleasant and them more productive... Respect the knowledge and intelligence of all employees.

Suppliers:

Share your corporate vision and internal framework for sustainability with suppliers.

Community:

Environmental Organizations and Government Programs:

Partner with environmental organizations. Participate in voluntary government programs with the Environmental Protection Agency such as: Green Lights, Energy Star Buildings and Climate Wise.

Networking:

Contact other companies with a similar vision, share ideas. Work with local universities... Share your accomplishments with others and multiply good practices through them...

The Public:

Develop auditing mechanisms open to public disclosure. Make public statements in support of sustainability principles... Sponsor community forums about local environmental issues. Open facilities to local school children to learn about sustainability and career opportunities.

Management:

Corporate Strategy - Establish top management commitment to long-term environmental strategy. Establish corporate and divisional sustainability vision statements... Gain certification in third party assessed environmental management system such as ISO 14001 or BS 7750. Create a process of managing all aspects of environmental stewardship. Develop well-defined corporate values, goals, decision making and response mechanisms. Evaluate product and service offerings for fit with a sustainable society.

Metrics: Measure all material and energy flows in physical and monetary units. Develop managerial "Full Cost Accounting" system... Create internal "Green Taxes" to highlight most profitable enterprise from total cost perspective.

Incentive Plans: Give rewards for individuals or teams with the best sustainability project. Tie monetary compensation to achieving well-defined environmental goals. Recognize outstanding commitment and progress toward sustainability.

Keeping the enthusiasm: Set reasonable goals and always celebrate your accomplishments. Learn through playing games. Develop a sense of competition and pride. Bring in college interns to research special projects to bring a fresh perspective...

PRODUCT:

Design: Redesign products to use less raw materials while delivering the same or greater value... Design products to last longer... to be repaired or selectively replaced when only a portion wears out. Consider the entire life cycle of product, including how it will be recovered and made into another useful product.

Packaging: Design out all product packaging, (e.g. taco shell)... Deliver products in bulk. Develop reusable packaging for work-in-process materials...

Manufacturing:

Energy:

Demand: Reclaim waste heat... review all electric motor systems to minimize installed horsepower and maximize motor efficiency. Design pumping systems with big pipes and small motors.

Source: Research and adopt alternative energy sources consistent with local surroundings, such as hydroelectric, bio-fuel, solar, wind power, etc. Negotiate Green Energy contracts with utilities...

Material: Adopt a zero waste mentality, design processes to create no waste or scrap. Adopt a zero defect mentality, most material defects become waste... Take corrective action on quality problems as far upstream as possible to minimize waste.

Marketing: Commit to taking back your products at the end of their lives. Rent only the service component of your products, e.g. warmth and light not electricity. Be conscious of the extent and strategy of external communications to avoid greenwash.

Purchasing:

Work with Suppliers: Share your corporate purchasing policy with all suppliers. Press suppliers to follow and document sustainable practices, and favor those that do. Press suppliers to take back packaging or not deliver it with the product. Buy services not products... Include the waste and embodied energy used to produce raw materials purchased from suppliers in your environmental footprint analysis.

Buy Sustainably: Establish a "Buy Sustainably" policy stating the corporate goals on specific items when possible. Circulate a list of recycled or environmentally friendly products to purchasing staff. Set out clear guidelines to follow. Support training for purchasing agents to understand the issues ... Share surpluses with other offices by publishing a regular list.

PLACE:

Facility:

Design: Increase insulation in walls and doors. Design HVAC and utility systems for maximum long-term flexibility and efficiency, e.g. under floor delivery, personal control. Maximize use of natural ventilation, heating and cooling. Give priority to pedestrians, mass transit and cyclists instead of automobile drivers. Design with the natural flows of the site in mind...

Energy: Conduct an energy audit.... Replace old boilers with new high efficiency units. Install properly sized variable speed motors/fans. Install heat exchangers on building exhaust ducts. Preheat boiler feedwater with waste heat... Regularly maintain all HVAC systems... Plant trees to shade eastern and western windows and air conditioners.

Lighting: Redesign lighting to fit work processes... Maximize use of natural day lighting.

Water: Reuse water whenever possible... Develop closed loops... Conduct water use audits...

Office:

Paper: Use a recycled paper ... Scrutinize distribution lists... Maximize use of bulletin boards. [Make] double sided coping is the norm. Route

magazines instead of getting separate copies... Communicate via e-mail when possible and don't print your e-mail messages...

Electronics: Purchase only energy saving electronic equipment... Lease the service of high-end electronics instead of buying them... Buy copiers, printers and fax machines that have or use refurbished parts and toner cartridges.

Maintenance: Invest in high quality maintenance to extend the life and maximize the efficiency of systems. Use only nontoxic cleaning compounds. Maximize use of all-purpose cleaners to reduce the number of chemicals used and to minimize potential danger of mixing. Buy cleaners in concentrated form that can be mixed at different strengths for different purposes, reduce packaging and transportation... Provide convenient and easy to understand recycling centers for common waste products...

Landscape: Leave as much habitat and vegetation as possible undisturbed by construction... promote biological diversity. Design to minimize impact on local environment. Compost organic matter. Mulch lawn clippings...

Transportation:

Product: ... Favor locally produced products... Locate facilities to minimize shipping distances to major market centers.

People: Offset employee air travel with tree planting through organizations such as 'Trees for Travel(tm).'Reduce number of trips by consolidating business or through better planning. Buy alternative fuel vehicles. Allow employees to telecommute or work alternative hours. Offer rebates to employees who use alternative transportation.... Offer public transportation passes.... Encourage video conferencing.[49]

Photo courtesy of NAVFAC

BASIC PUBLICATIONS AND INTERNET RESOURCES

PUBLICATIONS

The Hannover Principles, Design for Sustainability, 1992, William McDonough, http://www.virginia.edu/~arch/pub/hannover_list.html

Natural Capitalism: Creating The Next Industrial Revolution, Paul Hawken, Amory Lovins, & L. Hunter Lovins, 1999) Little Brown & Company; ISBN: 0316353167, http://www.naturalcapitalism.org/sitepages/pid5.asp

LEED(tm) "Leadership in Energy and Environmental Design" Green Building Rating System, January 1999, U.S. Green Building Council, http://www.usgbc.org/resource/index.htm

Our Ecological Footprint; Reducing Human Impact on the Earth, 1995, Mathis Wackernagel and William Rees, Illustrated by Phil Testemale, New Society Publishers, Philadelphia, PA.

Greening Federal Facilities: An Energy, Environmental, and Economic Resource Guide for Federal Facility Managers, 1997, prepared by Greening America, Sustainable Systems, Inc. and the U.S. Department of Energy, http://www.eren.doe.gov/femp/greenfed/

The Integrated Workplace: A Comprehensive Approach to Developing Workspace, GSA Office of Governmentwide Policy, Office of Real Property, May 1999, http://policyworks.gov/org/main/mp/library/policydocs/Completeiwrpt.pdf

Executive Order 13123, "Greening the Government Through Efficient Energy Management," June 3, 1999. http://www.pub.whitehouse.gov/uri-res/I2R?urn:pdi://oma.eop.gov.us/1999/6/4/6.text.[1]

WEBSITES

Laws, Executive Orders, And Other Official Directives: http://www.epa.gov/epahome/rules.html, For the most complete listing, visit this U.S. Environmental Protection Agency website.

The Whole Building Design Guide WBDG), http://www.wbdg.org/, A comprehensive, Internet-based portal to a wide range of federal and private sector, building-related criteria and technology.

NIST Building for Environmental and Economic Sustainability (BEES) Tool: http://www.bfrl.nist.gov/oae/bees.html, BEES measures and balances the environmental performance of building products, taking a life-cycle approach to quantify and balance environmental and economic performance. It follows the EPA Environmentally Preferable Purchasing (EPP) Program.

Key Elements of Sustainable Design: http://www.hok.com/sustainabledesign/, Hellmuth, Obata + Kassabaum, Inc., website with Case Studies, Materials Database, and a Sustainable Design Newsletter.

Sustainability Resources:http://minerva.acc.virginia.edu/~sustain/, The University of Virginia's Institute for Sustainable Design website has a comprehensive listing of resources.

World Business Council for Sustainable Development: http://www.wbcsd.ch/, A coalition of 125 international companies, aims to develop closer cooperation among business, government and organizations concerned with the environment. The website describes programs and concepts that link a better environment to the principles of economic growth.

CASE STUDIES

THE COMMONWEALTH OF AUSTRALIA'S DEPARTMENT OF FINANCE & ADMINISTRATION (DOFA)

In 1998, DOFA became the champion of Ecologically Sustainable Development (ESD) in the Commonwealth. DOFA's environmental goals are similar to ours, namely to improve energy efficiency, both in its own operations and in the community as a whole, reduce the environmental impacts arising from government operations, and reduce the financial impacts of government operations.

Through ESD, DOFA has made the Federal Parliament Building a national energy efficiency icon, reducing energy consumption and eliminating waste; and located the Royal Australian Mint, Environment Australia and the Australian Greenhouse Offices in renovated buildings that dramatically reduced energy consumption, incorporating many energy efficiency and waste minimization features.

DOFA has encountered barriers to the implementation of ESD similar to those found here in the U.S.; limited awareness among agencies and their suppliers and service providers, and the lack of organizational commitment due to the perception that sustainability is outside of their core asset and resource management functions. In addition, emphasis on short-term costs, to the detriment of life-cycle performance, lack of decision support tools and methodologies, and the lack of innovation by industry contribute further to the problem. Finally, inherent resistance to change, in the way that construction and property industries service the government has also slowed progress.

A number of other agencies, including Agriculture, Forestry and Fisheries Australia, and the Australian Bureau of Statistics, are currently developing sustainability indicators. The department of Environment and Heritage has developed hundreds of measures for biodiversity, land, estuaries and the sea, inland waters, community and local uses, atmosphere, human settlements, and natural and cultural heritage.

Logo courtesy of Green Seal

ABERDEEN PROVING GROUND (APG), ABERDEEN, MD - GETTING THE GREEN SEAL OF APPROVAL

The Aberdeen Proving Ground (APG) is a U.S. Army research and testing facility in Aberdeen, Maryland that occupies more than 72,500 acres and is comprised of 2,200 buildings housing more than 14 million square feet of floor space. It has been used for military ordnance materiel and chemical weapons design, research and testing since 1917.

Working with Green Seal, a nonprofit organization that sets environmental standards for manufactured products, APG reviewed the ingredients of over 2,200 paints used at the facility for environmentally damaging contents such as heavy metals, dangerous chemicals, and volatile organic compounds. Of the 2,200 paints from 13 manufacturers, 71 were identified as being the most environmentally friendly, as well as costing less than the more unacceptable paints. Because of the review, maintenance was not only made more environmentally sound, but also simpler since there are fewer types of paints to stock and track.

The benefits of this program were immediate. The Army was able to reduce the average cost of paint by $1.76 per gallon, providing ongoing savings for every job. Indoor air quality has been improved, and environmental damage, such as release of VOC's, has been reduced. Since they have identified the most environmentally preferable paints, APG is now able to restrict its purchases to these products and has added its environmental standards to purchase orders for all future paints and painting.[50]

INGLEWOOD CENTER, LARGO, MD - SMART THINKING AND PRACTICAL SOLUTIONS

Inglewood Center consists of two Prince Georges County Government office buildings that exhibited high rates of employee complaints and absenteeism. Efforts to improve the situation included improvements to the building's indoor air quality through a "Green Housekeeping Program" that changed the type of cleaning products used, and provided training for the janitorial staff on how to use the new products better to clean more effectively. HVAC systems were also cleaned and balanced as part of the on-going scheduled maintenance program. A second phase has been budgeted to make improvements to the ventilation systems for copier centers, kitchenettes, and janitors closets.

The first phase of the program, using less toxic cleaning elements in the proper manner, has provided significant improvements in indoor air quality, at little or no cost, by simply changing behavior, work processes, and operation and maintenance procedures. Employee air quality complaints and absenteeism have been reduced. Besides reducing harmful environmental effects, the program has also improved the labor/management relationship at the facility. Employees have taken renewed interest in activities within the facility and now display more "ownership" of the building. The program was so successful that the County tried a pilot program in the public schools, with similarly positive results. [51]

901 CHERRY, OFFICES FOR GAP INC., SUNNYVALE, CA - REFLECTING THE COMPANY'S VALUES

Modeled from the ground up to reflect Gap's values, style, and sensibilities, this office complex was designed by William McDonough + Partners and Gensler specifically to promote employee well-being. One of the two most energy efficient office buildings in Northern California, 901 Cherry goes beyond eco-efficiency, to eco-effectiveness, through features like an under-floor air system that can provide 100% outside air, work stations located within 30 feet of an operable window or landscaped atrium, and visual and physical connections to the outdoors. The building's innovative roof, covered by native grasses and wildflowers, provides thermal and acoustic insulation while protecting the underlying structure. Gap estimates that the paybacks for energy conserving features like the roof, daylighting, and the underfloor cooling system, alone; will be from four to eight years.

The environment isn't the only benefactor of the building's revolutionary design. The Gap expects a happier and more productive corporate community with open workspace and a full-service fitness center (including a swimming pool). One of the few remaining oak groves in the area was preserved as the centerpiece of an open-air courtyard. The building also features computer-activated lamps that gradually replace fading light in the early evening and an air conditioning system that stores cool night-time air beneath concrete floor slabs to be released during the day. Workspaces are designed to respond to a fast-moving company. Work settings are flexible and the underfloor cabling and air system cheaply and quickly accommodate layout changes. These amenities have already proved a significant asset in recruiting and retaining employees in a highly competitive job market. The 901 Cherry Office Building received a 1998 Business Week/Architectural Record Award recognizing its design achievement in responding inventively to Gap's business goals.[52]

Photo courtesy of The City of San Diego's Ridgehaven Green Building Demonstration Project

CITY OF SAN DIEGO DEPARTMENT OF ENVIRONMENTAL SERVICES, SAN DIEGO, CA - "GREEN AND WITHIN BUDGET"

The City of San Diego's Environmental Services Department now occupies a "Green Building" that simultaneously reduces energy consumption and pollution and increases worker productivity. "Ridgehaven," the three-story, 73,000 square foot building, was renovated in cooperation with San Diego Gas & Electric, The Electric Power Research Institute, and Public Technology, Inc.

The project shows the capacity to develop a green building on a limited budget. One example of the merging of environmental concerns with budgetary issues was in the selection of carpeting. To ensure low VOC emissions and high-recycled content, the City leased the carpet under an "evergreen lease," and made it an operational rather than a construction cost. Under the lease, the carpet manufacturer will rotate, maintain and replace the tiles. Existing doors, wall panels and hardware were reused, and recycled content materials, such as counter tops and lavatory doors made of recycled plastic were specified.

Other benefits include a 67 percent reduction in energy consumption; a 42 percent drop in water use, and improved indoor air quality that, based on other studies, should increase worker productivity. Payback for the energy efficient products used at Ridgehaven is less than four years.[53]

Photo courtesy of Dennison University, Todd Gys - Photographer

BARNEY MEMORIAL HALL, DENISON UNIVERSITY, GRANVILLE, OH - ENVIRONMENTAL PRINCIPLES PUT INTO PRACTICE

This project shows that renovating and reusing an existing historic facility can take advantage of an older building's affinity for the surrounding environment and the energy embedded in the original construction. The sustainable design process used integrated planning, design, and construction strategies to achieve notable results.

By using an existing facility, resource consumption can be minimized. No new land was cleared for development, and many of the original building features, such as windows, hardwood floors, fixtures, and furniture, were restored for reuse. The university collaborated with manufacturers and distributors of environmentally innovative products. Permanent displays were installed throughout the building and a web page was established.

Demolition and construction waste from the renovation project was recycled and reused as much as possible. Radiators, windows, ceiling tiles, insulation, wallboard, and computers were taken to recycling centers; and the original wood floors, doors, cabinets, shelves, slate blackboards, and floor tiles were reused. Recycled-content products were specified for the project, including wallboard, carpet, ceiling and floor tiles, furniture, and insulation. Special consideration was given to the materials used in carpet, plywood, furniture, paints, finishes, and adhesives to eliminate off-gassing. In addition, use of all cleaners and office products containing toxic substances was restricted.

The existing transoms, skylights, and large windows, now fitted with new light shelves, provided opportunities for using daylight to reduce artificial lighting loads. The artificial lighting uses continuous dimming circuits, occupancy sensors, and ultra-efficient fluorescent lights with electronic ballasts to make it more energy efficient. Provision has been made for future photovoltaic solar panel systems. New high-efficiency natural gas boilers reduce fossil fuel consumption and pollution associated with the inefficient, coal-fired central heating plant.[54]

Photo courtesy of NAVFAC

BUILDING 33 COMPLEX, WASHINGTON NAVY YARD, WASHINGTON DC - HISTORIC BUILDING REUSE

The Building 33 complex houses the new headquarters for the Naval Facilities Engineering Command (NAVFAC) and the Office of the Judge Advocate General and the Naval Legal Services Command (OJAG/NLSC), which moved from leased space in Alexandria, Virginia. In the first major move of two headquarters commands into the Washington Navy Yard, about 400 people from NAVFAC and 130 from OJAG/NLSC moved to the Yard. The Sherman R. Smoot Company of Columbus, Ohio constructed the $21 million project; and the architectural firm of Ewing Cole Cherry Brott of Philadelphia, Pa, developed programming and preliminary designs.

Dating from 1855, building 33 was originally used by the Navy as a manufacturing shop. In 1965, the building was converted to a supply warehouse. To preserve the historic building's appearance, a building-within-a-building was created, and the exterior facade restored. The renovated complex has 156,000 square feet of modern office space in keeping with the Navy Yard's century old practice of adaptive reuse.

The green features of Building 33 include the use of triple glazing to reduce heat transmission, the use of indirect/direct pendant light fixtures to create a pleasant, glare-free work environment; reduced chiller tonnage and the use of high-efficiency, variable speed motors on all equipment to lower energy consumption. The design incorporates recycled materials, natural lighting from skylights, automatically controlled dimmers, and low water consuming fixtures.[55]

Photo courtesy of HOK Architects, DonWong- Photographer

FEDERAL RESERVE BANK OF MINNEAPOLIS, MINNEAPOLIS, MN - BUILDING FOR NOW, AND THE FUTURE

The new Minneapolis Federal Reserve Bank was constructed with long-term asset value in mind. Designed by HOK, and completed in 1998, the 618,000 SF structure minimizes its impact on the environment by emphasizing energy conservation, low maintenance landscaping, water conservation, indoor air quality, environmentally preferable materials selection, and construction waste recycling.

An extremely tight exterior envelope was combined with increased natural lighting. The majority of the windows are triple-glazed, with two low-E films and argon gas fill. Lighting fixtures are high efficiency, many with occupancy sensors. The facility has a connected load of 0.85 watts/SF and 0.65 watts/SF of projected actual lighting load, 74 percent lower than the ASHRAE 90.1 target of 2.5 watts/SF maximum. Estimated net annual energy consumption is less than 45,000 BTUs per square foot.

Project materials were selected based on source sustainability, the amount of embodied energy in the material, the recycled content of the product, its ability to be recycled, and its effect on indoor air quality. This resulted in use of materials with enhanced durability, low maintenance and from predominantly local sources. Exterior materials include stone quarried less than 100 miles from the site and local brick. Interior materials include low-VOC paints and adhesives, formaldehyde-free wood products, and many with high-recycled content. All wood used in the building is from certified sustainable sources.

About 70 of the construction waste materials were separated and recycled with a decrease in construction costs. A salvage yard was created for materials that could be reused and not just recycled, such as waste wood from formwork.[56]

Photo courtesy of HOK Architects, Edward Purcell - Photographer

SC JOHNSON FACILITY, RACINE, WI - A SUSTAINABLE VISION THAT SUPPORTS THE ORGANIZATION

The new SC Johnson facility was designed to meet the company's organizational needs, while setting a new standard for environmentally responsible building. The design team integrated sustainability in the project by establishing environmental objectives at the outset. At about $130/SF for the building, the facility cost 10-15 percent less than the U.S. average for traditional office and lab buildings.

A low-maintenance site design incorporated a major regional drainage system, discovered beneath the site, using constructed ponds and wetlands to clean contaminated upstream runoff before release. Native and drought tolerant plants, such as prairie grass and wild flowers, were restored to the site, saving SC Johnson as much as $2,000 per acre in annual maintenance costs.

During construction, 86 tons of material waste, including metal, glass, wood, cardboard, concrete, and drywall, were recycled. Material suppliers were also required to take back pallets and packaging, and they made scrap wood available for use by local residents.

Maximizing daylight was the most important influence on the building's shape. A floor-to-floor height of 17 feet was required to accommodate laboratory piping and ductwork, permitting the use of 14-foot high ceilings in the office areas. On the southern side of the building, large windows with light shelves draw natural light into office floors, which are also lit from the central atrium skylight.

The building's raised floor is a "charged plenum" that supplies air to each workstation through a Johnson Controls "Personal Environmental Module," allowing each person to individually control heating and cooling at his or her workstation. Occupancy sensors shut the system off when the individual leaves the space. Considerable first cost savings were realized, since the system reduced the HVAC capacity requirements and required less ductwork.

Energy usage is 60 percent below the average for similar buildings, even less than the projected gross annual energy consumption of 73,000 BTU/SF. This reduced energy consumption will save SC Johnson nearly $100,000 per year. [57]

FOOTNOTES

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